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GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

The Lecture Season of 1918-1919. The lecture program for the coming season will include addresses by distinguished explorers and geographical writers on subjects of current interest. The dates are as follows: October 31, November 19, December 10, December 17, January 7, January 21, February 11, February 25, March 11, March 25, April 8, April 22. The lectures will be given, as usual, in the auditorium of the Engineering Societies' Building, 29 West Thirty-ninth Street. On October 31 Vilhjálmur Stefánsson will lecture on his four years' expedition to the Arctic, from which he has just returned and about the latter half of which he reports in the present number of the *Review*. Later Mr. Theodoor de Booy will lecture on his recent expedition, conducted under the auspices of this Society, to the Sierra Perijá of Venezuela, about which brief mention was made in the August *Review* (p. 172). Another speaker will be Major Douglas W. Johnson, who will give an address on the field studies he has undertaken during the past year under the auspices of this Society as a basis for a report on the relation of physical geography and topography to military strategy.

SOUTH AMERICA

Irrigation in Chile. Central Chile is the granary of the west coast of South America. It must supply the nitrate workers of the desert north and the sheep men of bleak Magellan. This condition is accentuated by the present world crisis in foodstuffs. But from the Aconcagua to the Maule ($32\frac{3}{4}^{\circ}$ - $35\frac{1}{2}^{\circ}$ S.) there is a yearly average of less than 20 inches of rainfall, and, unfortunately, that all occurs in the winter months. The summers are cloudless, dry, dusty. Most of the hillsides and much of the valley floor have been used for nothing but grazing, and for that only during the rainy season. The herds of horses, cattle, and sheep from the *haciendas* are driven to the high mountain grass lands in early spring, their *huaso* herdsmen remaining there with them until winter rains freshen the hillside pastures and untilled flats of the central valley. In addition to this unfavorable distribution of rainfall, the amount varies greatly from year to year. In 1886 at Santiago there were only 4.99 inches, while in 1900 there were 32.26 inches. Rains are brought by the north winds that accompany passing cyclonic centers. These centers often move across the Cape Horn region, and at such times central Chile is well beyond their influence (R. C. Mossman: Southern Hemisphere Seasonal Correlations, *Symons's Meteorol. Journ.*, Vol. 48, 1913, seven articles; reference on page 2). Hence Chile has long depended upon irrigation. From Inca times the sediment-laden waters of her numerous streams, that, rising at an elevation of some 10,000 feet in the Andes, reach sea level in less than 150 miles, have been utilized for agriculture. The fields along the river terraces within the Cordillera and the great estates on the piedmont slopes and deep alluvial plains of the central valley would be unproductive were it not for the waters of the Aconcagua, Maipo, Rapel, Maule, Itata, and Bio Bio Rivers. Every mountainside carries its canal, sometimes hanging high up on the slope, sometimes fringing the foothills. Lines of Lombardy poplars and weeping willows border these watercourses, dividing the farms up like checkerboards. The great Maipo canal has been in operation for over a century. Associations of land owners, in some cases individual *hacendados*, have maintained these irrigation systems. Besides turning the river waters upon their land, many Chilean farmers have constructed reservoirs to catch and hold winter rains for use during the growing season (see Roberto Opazo G.: Los problemas del regadío, *Bol. Inspec. de Geogr. y Minas*, Vol. 11, 1915, pp. 271-283, Santiago de Chile). These efforts have made a veritable garden out of a region which otherwise would produce little else than thorny shrubs.

But until recently all irrigation was the result of private enterprise. Consequently, much land was left untilled, and Chile imported wheat from Australia, Uruguay, and California. Now, however, the government (composed almost entirely of wealthy farmers) is making an effort to increase agricultural products. They realize that the nation must be made less dependent upon its great but insecure monopoly of nitrate and must be more self-sustaining, too, in its food supply. Fiscal aid is being extended to the construction of irrigation works. Several extensive projects are under way or already completed. In the beautiful horticultural region of Nos, a few miles from Santiago, an

extensive plant has been installed. It waters 25,000 hectares, or about 62,000 acres (*Bull. Pan Amer. Union*, March, 1912, p. 372). The Cachapoal canal, also made possible by the government loan policy, irrigates 300,000 hectares of grain fields, vineyards, and orchards. Near the Laja River some 45,000 hectares will be made more productive by canals leading from this stream. A very pretentious project that has been approved by the Department of Public Works is that by which canals and tunnels will carry water from the Melado, a mountain tributary of the Maule, through an intervening ridge into the valley of the Aneoa, and from there to the farms of Linares. This is one of the best wheat sections of the country. It also produces excellent grapes and apples. Irrigation on this large scale will reclaim many acres of hitherto uncultivated land (*South Amer. Journ.*, July 28, 1917, p. 56). Even districts in the north are to profit by the government's interest in agriculture. One of the plans includes the construction of dams and reservoirs on the upper Coquimbo, by which it will be possible to irrigate the entire valley (*South Amer. Journ.*, Aug. 11, 1917, p. 86). Coquimbo raisins are famous along the west coast.

As is well known much of the soil in the northern provinces is productive if watered. Evidence of this is furnished by the rapid growth of flowers and grass after each infrequent rain in that desert region and by the band of vegetation that marks the cloud line along the barren coastal range.

Greater use of the Chilean streams for irrigation should also aid in preventing the disastrous floods in many of the rivers, caused in spring by rapid melting of the snow fields and in winter by the occasional heavy rains.

AFRICA

The Faunal Regions of Africa, Based on the Distribution of Fishes. The zoögeographical regions of Ethiopian Africa, i. e. Africa south of the Sahara, as established by Wallace, were four in number—West, East, and South Africa, and Madagascar with the Mascarenes. Recent discoveries have shown that many forms then believed to be peculiar to South Africa are common to East Africa also. Today the zoögeographer, as Heller says elsewhere in this number of the *Review* (p. 301), recognizes two primary divisions of the continent (excluding Madagascar): (1) the humid and forested west and (2) the comparatively dry east and south. With the faunal regions the floral are in general agreement. From the work of Engler (see especially: *Pflanzengeographische Gliederung von Afrika, Sitzungsber. Kgl. Preuss. Akad. Wiss.*, 1908, Part 2; *Die Pflanzenwelt Afrikas*, Vol. 1, in two parts, Leipzig, 1910) the boundaries of the floral divisions and their subdivisions have been worked out and represented on a map by members of the staff of the American Museum of Natural History (Engler's own map may appear in Vol. 5 of his "*Pflanzenwelt Afrikas*"; see, under Engler, page 379 of this number). Their map is reproduced on page 744 of a memoir on the "Freshwater Fishes of the Congo Basin" by J. T. Nichols and Ludlow Griscom and is used to illustrate the general conformity with the ichthyofaunal regions of the continent as worked out by them (Scientific Results of the American Museum of Natural History Congo Expedition, 1909-1915; Ichthyology, No. 1, *Bull. Amer. Mus. Nat. Hist.*, Vol. 37, 1917, pp. 653-756).

On the basis of its freshwater fishes the continent in its entirety may be divided into five regions (map on p. 741 of memoir): Northwest Africa; West Tropical Africa (i. e. from the Niger to Angola and west of the Great Lakes); the Nile Basin and Northeast Africa; East Africa with South Africa; Madagascar. The northwestern region is purely northern (Holarctic) in character, the relations with European forms being very close. It coincides with Engler's Mediterranean region. The Madagascar region has no real ichthyological affinities with the mainland. For the remainder of the continent the great dividing line is between the west and the east with the south. The fish fauna of West Tropical Africa is entirely distinctive, and it is much the richest of any of the African divisions. Where the forms of the east are of northern or oriental origin those of western Africa also include many peculiar forms and forms of primitive character which either originated in Africa or have survived there only. The Nile Basin and the northeastern division, which corresponds with Engler's northeastern subprovince, shows a mingling of forms, European and Asiatic and West African. The East African region is as poor in fish fauna as it is rich in the larger mammalian fauna. Most species are related to those of the Nile Basin, and the few western forms appear to have been derived from this source. Lake Tanganyika presents a problem, and a definite position has not been assigned to it. The paucity of forms increases southward, and there appears no reason for making a separate faunal region out of South Africa. However, in the extreme southwest, round Cape Town, there is found the single peculiar African form that is not West Tropical in its range; this is *Galaxias*, confined to the very limited area that Engler separates as a distinct region on the basis of its aberrant flora.

The distribution of peculiar forms has important bearing on the problem of the Antarctic Continent, one of the remnants of ancient Gondwanaland, evidence for which has lately received strong support through the *Glossopteris* flora brought back by the *Terra Nova* expedition from latitude 85° S. (A. C. Seward: Antarctic Fossil Plants, Natural History Results of the British Antarctic ("Terra Nova") Expedition, 1910, Geology, Vol. 1, No. 1, pp. 1-49, 1914). From data now available it appears not improbable that the ancient and primitive types of African fishes originated in South Africa or some other part of the then continent of Gondwanaland which enjoyed humid conditions. Desiccation would cause these forms to become extinct or to migrate to regions of more favorable conditions—to western Africa, where they have persisted.

On Future Boundaries in Central Africa. In tropical Africa, where territorial division has been so rapid a process in so little known a land, boundaries have been developed on the doctrines of *hinterland* and *spheres of influence* (Curzon's "Frontiers," 1907, pp. 43, 44). In consequence the "artificial" frontier figures largely. Such boundaries can only be regarded as preliminary lines. Already certain adjustments have been made; but it is the reconstruction following the war that will give the great opportunity for boundary reform. Tentative suggestions of reform have been put forward in an article "A Central African Confederation" appearing in the *Journal of the African Society* (July, 1918, pp. 276-306, with map, 1:12,000,000) above the signature "Africanus." Discussion is limited to eastern tropical Africa on the thesis that the future shall see a compact British territory from south of the Sudan and Abyssinia to the Zambezi and east of the Belgian Congo and Angola to the Indian Ocean and Mozambique.

In this region existing boundaries are boldly discarded. In place of the existing divisions of Uganda, British East Africa, and German East Africa, and in opposition to amalgamations of the two former or the two latter, as has been proposed, there is propounded a longitudinal division following the main natural divisions of the country. These divisions include a coastal belt running from the Juba to the Rovuma; a highland belt from south of Lake Rudolph to the Mahenge plateau, and a modified Uganda, centered round Victoria Nyanza by addition of the Kavirondo country of British East Africa and of the German territory draining to the lake. It is further proposed to take parts of the Nile and Rudolph provinces from the present Uganda and add them to the Sudan. Northern Rhodesia would remain practically unchanged save for a small addition of similar country round the southeastern end of Lake Tanganyika. The southern plateaus of German East Africa would be added to Nyasaland, giving this heretofore cramped province the head of Lake Nyasa.

The geographical basis for the first three of these divisions is very clearly marked. The coastal belt is the region of tropical plantations. Here, if it be deemed advisable, would be the suitable region for East Indian colonization. The highland belt includes the areas suitable for white settlement. Quite different are the problems in Uganda, which must remain a black man's country. The selection of natural regions for administrative units in the case of these three divisions ignores a principle which the statesman-geographer recognizes as one of the cornerstones of his policy. This is that, to insure stability and permanence, a state should have, second only to racial unity, a diversity of natural regions, in order to make full use of the interplay of economic forces which such a composition implies. However, this principle might be considered less valid in the case of colonies which, because of the stage of their development, were not suited to self-government.

The location of the centralized authority of the confederation is a matter of importance. The question of a central administration for the British possessions in eastern Africa has been discussed before, and Zanzibar has been suggested as the seat for such administration. The present proposal would place that seat in Kivu or some other part of Ruanda. This is as far west as Zanzibar is east, but the situation is splendidly healthful, and the lack of communications, at present the great obstacle, could be amended. The fate of Ruanda as a whole is particularly interesting: though it is a region suitable for white settlement it has a dense native population. Here it is suggested that, excluding an area for the seat of the proposed federal administration, the remainder should be constituted a native reserve.

Mount Kenya: Notes on the Geography of an Equatorial Snow Peak. A snowy equatorial peak should prove an object of particular attraction to the geographer: few, however, have been the observations on Mount Kenya, over 17,000 feet high and lying exactly on the equator east of the Great Rift valley of east-central Africa. The more accessible Kilimanjaro is better known; likewise Ruwenzori. The chief expeditions to Kenya have confined themselves to its western slopes. Teleki, the first European to ascend Kenya above tree line (1887), J. W. Gregory (1893), and Mackinder, who has

made the first and only ascent to the summit (1899), all made their explorations from the west. The Roosevelt expedition skirted the western and northern slopes of the mountain. An attempt on the southeastern slope was made by Dundas in 1891, but the highest point reached was only 8,700 feet. Five years later Kolb reached much the same position on the southeast, while on the northeast he attained a considerably greater altitude (George Kolb: Von Mombasa durch Ukambani zum Kenia, *Petermanns Mitt.*, Vol. 42, 1896, with map, 1:1,000,000, Pl. 17). Hutchins, while engaged in a forest survey of British East Africa, made a complete circuit of Kenya, for most of the distance at an altitude of 12,000 feet, and he has contributed our chief knowledge of the southeastern part of the mountain (Report on the Forests of Kenia, East Africa Protectorate, *Colonial Rept. No. 41*, 1907; see also "Report on the Forests of British East Africa," *British Parliamentary Paper Cd. 4723*, 1909, and A Visit to Mount Kenia, *Scottish Geogr. Mag.*, Vol. 25, 1909, pp. 346-352).

There are considerable differences in zonal distribution between the eastern and western sides of the mountain, especially in the lower forest zone, which is economically the most important. On the west the forest begins at an elevation of 7,000 to 7,500 feet. For the northwest Alluau and Jeannel place it as high as 7,870 feet (Le Mont Kénia en Afrique Orientale Anglaise, *Rev. Gén. des Sci.*, July 15, 1914, pp. 639-644). On the southeast the lower edge of the forest begins about 6,000 feet. Here it is much denser, and the place of the distinctive juniper (cedar) of the west is taken by great camphor trees. The drier west appears to have suffered greatly from fire, and the higher altitude at which the forest begins may be due in part at least to the destructive grazing fires of the Masai. Evidently precipitation is the dominant factor controlling the differences of the vegetational zones. Kenya is exposed to prevailing easterly winds (southeast trade, northeast monsoon). Hutchins estimated that, where the rainfall of the southeastern slope was 80 to 120 inches a year, that of the west was 50 to 90 inches.

The most recent observations on Kenya by Captain G. St. J. Orde Brown (The South-east Face of Mount Kenya, *Geogr. Journ.*, June, 1918, pp. 389-392) emphasize the extreme humidity on the mountain, a fact which explains the low limit of snow (about 14,500 feet on the southeast), as von Höhnel, Teleki's companion, comments, lower than that of Kilimanjaro (Ostäquatorial-Afrika, zwischen Pangani und dem neuentdeckten Rudolf-See, *Ergänzungsheft zu Petermanns Mitt. No. 99*, 1890). For at least nine months of the year Kenya is "covered with mist, varied by heavy rain"; in fact the only months when finer weather can be depended on are February and early March. A marked consequence of the heavy rainfall is seen in the high degree to which the southeastern face is eroded, the gorges here being cut much more deeply than on the other sides. The aspect of the summit from the south is described as presenting the appearance of a broken-down crater lip, from the western side of which the highest point projects as a rocky tooth. A similar interpretation was made by Teleki from the west, but Gregory proved that denudation has removed the original crater wall and that the final peak represents the eroded central core of the ancient volcano. Further exploration of the peak would be desirable, and, according to Captain Brown, who offers practical suggestions for such an undertaking, it should not prove difficult to anyone with mountaineering experience if made at the proper season of the year.

AUSTRALASIA AND OCEANIA

Rainfall Maps of Australia. The Australian Commonwealth Bureau of Meteorology, Melbourne, has distributed its rainfall maps for 1916 and 1917. For each year the mean annual rainfall is shown on a large sheet, on the reverse of which there are twelve small maps showing the monthly rainfall. On the latter the areas which had a rainfall above the average are shaded blue, while those which had no rainfall, or less than "10 points of rain," are colored light brown. The general conditions of excess or deficiency are thus clearly indicated. Another set of small charts shows, for the last eight or ten years, the areas which had above the average rainfall. The discussion of the mean annual precipitation for 1916 and 1917 is clear and instructive, an especially noteworthy feature of this discussion being the emphasis which is laid on the *controls* of the rainfall of each year. In far too many cases such a text is merely a statement of the *facts* of rainfall amount and distribution, which facts can, of course, be easily seen on the charts.

The year 1916 was a remarkable one on account of the extraordinarily abundant rainfalls of the winter, spring, and early summer. These seem to have been the direct result of remarkably sustained air movements from the tropics over the more temperate latitudes. From June to December there was no month in which the rainfall was not a record over some portion of the Commonwealth. Disastrous floods occurred in many sections, notably in September, early October, and again in December. Curiously enough,

the weather conditions in 1917 were very similar to those of the preceding year, the air movements from the tropics into higher latitudes being maintained practically throughout the year. Therefore, a record wet year was again recorded at many stations. It is an interesting fact that the air-drift from the tropics in 1917 appears to have been preponderantly from the northwest. Hence the rains were more abundantly distributed on the northwestern than on the southeastern slopes of the highlands on the eastern and southeastern coasts of Australia. Very disastrous floods occurred at many places during the year, as in 1916. The occurrence of these two years of unusually heavy rains naturally lends peculiar interest to the conditions of the years which are to follow and to the search for the ultimate causes of the marked air movement from the tropics which brought about these wet years.

R. DEC. WARD

POLAR REGIONS

Recent Economic Developments in Spitzbergen. While much of eastern Spitzbergen remains unknown, the greater part of the west has been completely surveyed. With the exception of Prince Charles Foreland, a long island off the west coast, of which an exhaustive survey has been made by Dr. W. S. Bruce, the surveys have been conducted by Norwegians. Norway's scientific interest in Spitzbergen began in 1906 with the work carried out in King Haakon VII Land by Isachsen. The course of the successive Norwegian expeditions has been carefully followed in the contemporaneous issues of *La Géographie*. The last number of *La Géographie* (Vol. 32, 1918, pp. 96-101) gives a preliminary report of the 1917 expedition to Spitzbergen commanded by Adolf Hoel and Captain Sverre Røvig.

The work of the expedition was considerably impeded by unusual ice conditions, following an extraordinarily severe winter. The mean temperature of each month from October, 1916, to August, 1917, was below normal, April being 10° below. The work of the hydrographic party suffered most keenly. The field of their operations, from Ice Fiord to Bell Sound, the two major re-entrants penetrating from the west the south-central part of the main island, was not clear of ice until August 10 and was closed again on August 26 by masses of ice from the eastern pack doubling South Cape, the main island's southernmost point—a not uncommon event, as Rudmose Brown notes in commenting on the bad ice conditions of 1914 (R. N. Rudmose Brown: Spitsbergen in 1914, *Geogr. Journ.*, Vol. 45, 1915, pp. 10-23).

Topographic work was carried on in the territory pertaining to the Norwegian coal company west and south of Advent Bay, a small indentation on the southern side of Ice Fiord. For the company there was executed a map on the scale 1:10,000, which will permit of an accurate estimate of their coal resources.

The geologists completed the map of the coal-bearing region between Ice Fiord and Bell Sound and carried out researches south of the latter opening. The work accomplished represents the first part of a program designed to cover a period of five years, of which one of the primary objects is the extension of topographic and geologic surveys over the region between Bell Sound and South Cape. The projected work has a distinctly economic bias. Apart from a comparatively small government subvention it is financed by the coal companies interested.

Mention of economic interests inevitably brings one back to the political situation, now more interesting than ever. The war makes the status of *terra nullius* less tenable than before and appears to have rendered impossible any system of joint control (cf. Robert Lansing: A Unique International Problem, *Amer. Journ. Internatl. Law*, Vol. 11, 1917). German designs, revealed in the terms of the treaty of Brest Litovsk, have especially aroused apprehensions in Great Britain, one of the major claimants in the Spitzbergen archipelago. A statement of the British claims has recently been published by the Council of the Royal Geographical Society (British Interests in Spitsbergen, *Geogr. Journ.*, April, 1918, pp. 245-249). Press despatches from London under date of October 2 report the seizure several months ago by a British expedition of German coal and iron mines in Spitzbergen. The expedition was under the command of Sir Ernest Shackleton. A large number of miners, full mining equipment, and supplies sufficient for three years were taken, and work is now going on on a large scale. Captain Wild, who was with Shackleton in the Antarctic, is in charge of operations.

MATHEMATICAL GEOGRAPHY

Standard Time at Sea. In the matter of time-keeping a ship at sea has been "a law unto itself." The general practice has been to keep approximately local time, a proceeding in which there was no exactitude and much liability to confusion. Last year, through the activity of the Bureau des Longitudes, the French Admiralty established a

reform by extending to sea the time zones of the land, a reform subsequently taken up by the navies of Britain and Italy (P. Vincent: *Planisphère des Fuseaux Horaires*, map in 1:72,000,000, equatorial scale, Service Hydrographique, Ministère de la Marine, 1917; *L'extension à la mer du régime des fuseaux horaires*, *La Nature*, March 2, 1918, pp. 143-144). The results of a conference on this subject held by the British Admiralty are summarized by the *Geographical Journal* for February (Standard Time at Sea, pp. 97-100). The conference recommended the adoption of the boundaries of the time zones established by the French system, with which there was general agreement. Only in two respects were changes proposed, in the decision against usage of summer time on the high seas and in a matter of nomenclature. In the French system the time zones are numbered eastwards from 0 (Greenwich zone) to 23. To prevent ambiguity in reduction to Greenwich time the conference suggested the use of numerals with + signs for zones west of Greenwich (zero) to the date line and — signs for zones east of Greenwich to the date line.

There was also recommended a corollary reform of much practical convenience to navigators, the substitution of the civil for the astronomical day (A. C. D. Crommelin: *Time at Sea and the Astronomical Day*, *Nature*, April 25, 1918). In one respect the conference failed to arrive at a satisfactory conclusion—the matter of terminology; no adequate equivalent was found for the French *fuseau horaire*; the term “zone” can only be justified on the ground of accepted usage.

GEOGRAPHICAL NEWS

PERSONAL

MR. CHARLES C. COLBY, for some time connected with the George Peabody College for Teachers at Nashville, Tenn., and later with the University of Chicago, has been promoted to an assistant professorship in geography at the latter institution.

PROFESSOR W. M. DAVIS read a paper on “The Peculiar Geographical Features of Northeastern France and Their Bearing on the War” at a general meeting of the American Philosophical Society at Philadelphia on April 18-20.

MRS. NORMAN HAPGOOD (née Elizabeth K. Reynolds), whose article on “The Economic Resources of the Russian Empire” in the April, 1916, number of the *Review* will be recalled, is giving a course in Russian at Dartmouth College. The course is the first of its kind to be given at this institution; the geographical aspects of Russian life are given consideration.

PROFESSOR W. H. HOBBS of the University of Michigan read a paper on “The Relation of Deposits of Iron and Coal to the Great War” at a general meeting of the American Philosophical Society at Philadelphia on April 18-20.

PROFESSOR VAUGHAN MACCAUGHEY, professor of botany at the College of Hawaii, Honolulu, has been lecturing on “The Islands of the Pacific and the World War” at educational centers during the past summer.

DR. GRIFFITH TAYLOR, physiographer of the Australian Commonwealth Bureau of Meteorology, whose work has frequently been mentioned in the *Review*, is giving a course of thirty lectures on Australian geography and meteorology at the University of Melbourne during the second and third terms, commencing June 21. Ten lectures are devoted to meteorology, four to climatology, six to land forms, and ten to economic geography. The group on climatology includes lectures on the control of settlement by temperature and rainfall, and the settlement of the Australian tropics; the group on economic geography takes up individually the resources of the seven divisions, including Tasmania, which constitute the Australian Commonwealth.